

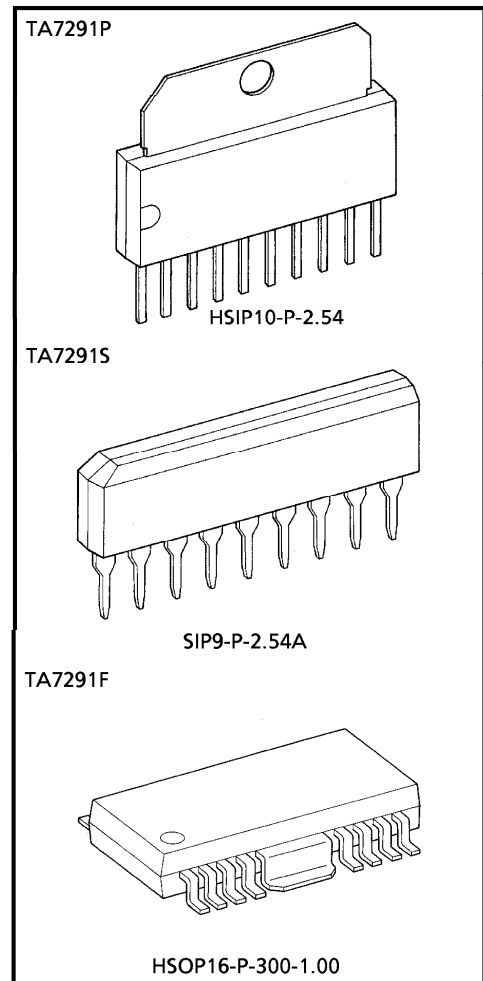
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

**TA7291P, TA7291S, TA7291F****BRIDGE DRIVER**

The TA7291P/S/F are Bridge Driver with output voltage control.

**FEATURES**

- 4 modes available (CW/CCW/STOP/BRAKE)
- Output current : P type     1.0 A (AVE.) 2.0 A (PEAK)  
                                  S/F type  0.4 A (AVE.) 1.2 A (PEAK)
- Wide range of operating voltage :  $V_{CC}(\text{opr.}) = 4.5\sim 20\text{ V}$   
 $V_S(\text{opr.}) = 0\sim 20\text{ V}$   
 $V_{\text{ref}}(\text{opr.}) = 0\sim 20\text{ V}$
- Build in thermal shutdown, over current protector and punch = through current restriction circuit.
- Stand-by mode available (STOP MODE)
- Hysteresis for all inputs.

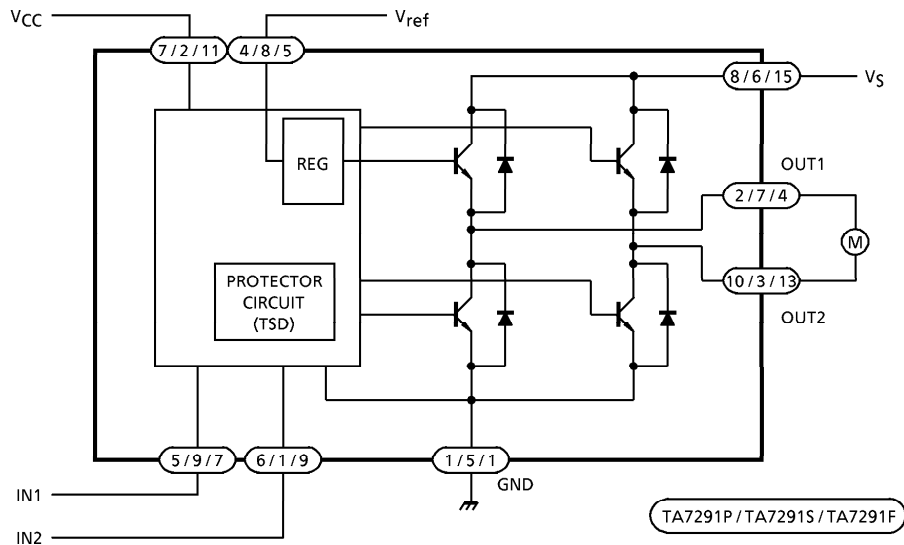


Weight  
 HSIP10-P-2.54 : 2.47 g (Typ.)  
 SIP9-P-2.54A : 0.92 g (Typ.)  
 HSOP16-P-300-1.00 : 0.50 g (Typ.)

980910EBA1

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**BLOCK DIAGRAM**



**PIN FUNCTION**

| PIN No. |   |    | SYMBOL           | FUNCTIONAL DESCRIPTION                   |
|---------|---|----|------------------|------------------------------------------|
| P       | S | F  |                  |                                          |
| 7       | 2 | 11 | V <sub>CC</sub>  | Supply voltage terminal for Logic        |
| 8       | 6 | 15 | V <sub>S</sub>   | Supply voltage terminal for Motor driver |
| 4       | 8 | 5  | V <sub>ref</sub> | Supply voltage terminal for control      |
| 1       | 5 | 1  | GND              | GND terminal                             |
| 5       | 9 | 7  | IN1              | Input terminal                           |
| 6       | 1 | 9  | IN2              | Input terminal                           |
| 2       | 7 | 4  | OUT1             | Output terminal                          |
| 10      | 3 | 13 | OUT2             | Output terminal                          |

P Type : PIN ③, ⑨ : NC

S Type : PIN ④ : NC

F Type : PIN ②, ③, ⑥, ⑧, ⑩, ⑫, ⑭, and ⑯ : NC

For F Type, We recommend FIN to be connected to the GND.

**FUNCTION**

| INPUT |     | OUTPUT |      | MODE     |
|-------|-----|--------|------|----------|
| IN1   | IN2 | OUT1   | OUT2 |          |
| 0     | 0   | ∞      | ∞    | STOP     |
| 1     | 0   | H      | L    | CW / CCW |
| 0     | 1   | L      | H    | CCW / CW |
| 1     | 1   | L      | L    | BRAKE    |

∞ : High impedance

(Note) Inputs are all high active type

**MAXIMUM RATINGS (Ta = 25°C)**

| CHARACTERISTIC        |        | SYMBOL           | RATING    | UNIT |
|-----------------------|--------|------------------|-----------|------|
| Supply Voltage        |        | V <sub>CC</sub>  | 25        | V    |
| Motor Drive Voltage   |        | V <sub>S</sub>   | 25        | V    |
| Reference Voltage     |        | V <sub>ref</sub> | 25        | V    |
| Output Current        | PEAK   | P Type           | 2.0       | A    |
|                       |        | S / F Type       | 1.2       |      |
|                       | AVE.   | P Type           | 1.0       |      |
|                       |        | S / F Type       | 0.4       |      |
| Power Dissipation     | P Type | P <sub>D</sub>   | (*1) 12.5 | W    |
|                       | S Type |                  | (*2) 0.95 |      |
|                       | F Type |                  | (*3) 1.4  |      |
| Operating Temperature |        | T <sub>opr</sub> | - 30~75   | °C   |
| Storage Temperature   |        | T <sub>stg</sub> | - 55~150  | °C   |

(\*1) T<sub>c</sub> = 25°C (TA7291P)

(\*2) No heat sink

(\*3) PCB (60 × 30 × 1.6 mm, occupied copper area in excess of 50%) Mounting Condition.

Wide range of operating voltage : V<sub>CC</sub>(opr.) = 4.5~20 V

V<sub>S</sub>(opr.) = 0~20 V

V<sub>ref</sub>(opr.) = 0~20 V

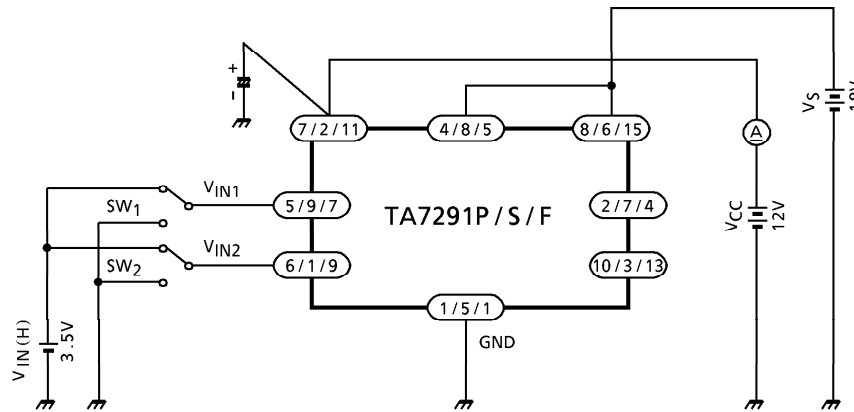
V<sub>ref</sub> ≤ V<sub>S</sub>

**ELECTRICAL CHARACTERISTICS** (Unless otherwise specified,  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 12\text{V}$ ,  $V_S = 18\text{V}$ )

| CHARACTERISTIC              |            | SYMBOL         | TEST CIR-CUIT | TEST CONDITION                                                                             | MIN.                                                                                  | TYP. | MAX. | UNIT          |
|-----------------------------|------------|----------------|---------------|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------|------|---------------|
| Supply Current              |            | $I_{CC1}$      | 1             | Output OFF, CW/CCW mode                                                                    | —                                                                                     | 8.0  | 13.0 | mA            |
|                             |            | $I_{CC2}$      |               | Output OFF, Stop mode                                                                      | —                                                                                     | 0    | 50   | $\mu\text{A}$ |
|                             |            | $I_{CC3}$      |               | Output OFF, Brake mode                                                                     | —                                                                                     | 6.5  | 10.0 | mA            |
| Input Operating Voltage     | 1 (High)   | $V_{IN1}$      | 2             | $T_j = 25^\circ\text{C}$                                                                   | 3.5                                                                                   | —    | 5.5  | V             |
|                             | 2 (Low)    | $V_{IN2}$      |               |                                                                                            | GND                                                                                   | —    | 0.8  |               |
| Input Current               |            | $I_{IN}$       |               | $V_{IN} = 3.5\text{V}$ , Sink mode                                                         | —                                                                                     | 3    | 10   | $\mu\text{A}$ |
| Input Hysteresis Voltage    |            | $\Delta V_T$   |               | —                                                                                          | —                                                                                     | 0.7  | —    | V             |
| Saturation Voltage          | P/S/F Type | Upper Side     | 3             | $V_{ref} = V_S$ , $V_{OUT} - V_S$ measure<br>$I_O = 0.2\text{A}$ , CW/CCW mode             | —                                                                                     | 0.9  | 1.2  | V             |
|                             |            | Lower Side     |               |                                                                                            | $V_{ref} = V_S$ , $V_{OUT} - \text{GND}$ measure<br>$I_O = 0.2\text{A}$ , CW/CCW mode | —    | 0.8  |               |
|                             | S/F Type   | Upper Side     |               | $V_{ref} = V_S$ , $V_{OUT} - V_S$ measure<br>$I_O = 0.4\text{A}$ , CW/CCW mode             | —                                                                                     | 1.0  | 1.35 |               |
|                             |            | Lower Side     |               | $V_{ref} = V_S$ , $V_{OUT} - \text{GND}$ measure<br>$I_O = 0.4\text{A}$ , CW/CCW mode      | —                                                                                     | 0.9  | 1.35 |               |
|                             | P Type     | Upper Side     |               | $V_{ref} = V_S$ , $V_{OUT} - V_S$ measure<br>$I_O = 1.0\text{A}$ , CW/CCW mode             | —                                                                                     | 1.3  | 1.8  |               |
|                             |            | Lower Side     |               | $V_{ref} = V_S$ , $V_{OUT} - \text{GND}$ measure<br>$I_O = 1.0\text{A}$ , CW/CCW mode      | —                                                                                     | 1.2  | 1.85 |               |
| Output Voltage (Upper Side) | S/F Type   | $V_{SAT U-1}'$ | 3             | $V_{ref} = 10\text{V}$ , $V_{OUT} - \text{GND}$ measure, $I_O = 0.2\text{A}$ , CW/CCW mode | —                                                                                     | 11.2 | —    | V             |
|                             |            | $V_{SAT U-2}'$ |               | $V_{ref} = 10\text{V}$ , $V_{OUT} - \text{GND}$ measure, $I_O = 0.4\text{A}$ , CW/CCW mode | 10.4                                                                                  | 10.9 | 12.2 |               |
|                             | P Type     | $V_{SAT U-3}'$ |               | $V_{ref} = 10\text{V}$ , $V_{OUT} - \text{GND}$ measure, $I_O = 0.5\text{A}$ , CW/CCW mode | —                                                                                     | 11.0 | —    |               |
|                             |            | $V_{SAT U-4}'$ |               | $V_{ref} = 10\text{V}$ , $V_{OUT} - \text{GND}$ measure, $I_O = 1.0\text{A}$ , CW/CCW mode | 10.2                                                                                  | 10.7 | 12.0 |               |
| Leakage Current             |            | Upper Side     | 4             | $V_L = 25\text{V}$                                                                         | —                                                                                     | —    | 50   | $\mu\text{A}$ |
|                             |            | Lower Side     |               | $V_L = 25\text{V}$                                                                         | —                                                                                     | —    | 50   |               |
| Diode Forward Voltage       | S/F Type   | Upper Side     | 5             | $I_F = 0.4\text{A}$                                                                        | —                                                                                     | 1.5  | —    | V             |
|                             | P Type     | Lower Side     |               |                                                                                            | $I_F = 1\text{A}$                                                                     | —    | 2.5  |               |
|                             |            | S/F Type       |               | Upper Side                                                                                 | $I_F = 0.4\text{A}$                                                                   | —    | 0.9  |               |
|                             | P Type     | Lower Side     |               | $I_F = 1\text{A}$                                                                          | —                                                                                     | 1.2  | —    |               |
| Reference Current           |            | $I_{ref}$      | 2             | $V_{ref} = 10\text{V}$ , Source mode                                                       | —                                                                                     | 20   | 40   | $\mu\text{A}$ |

**TEST CIRCUIT 1**

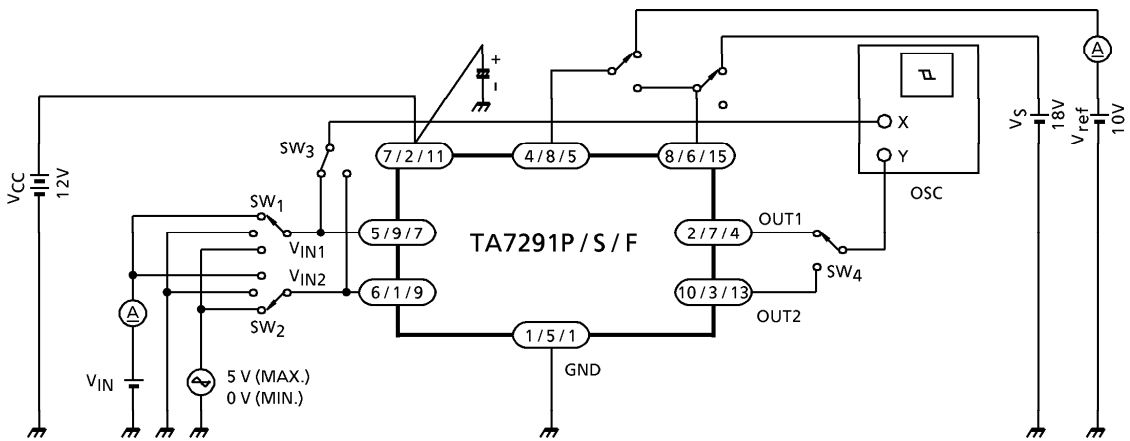
$I_{CC1}$ ,  $I_{CC2}$ ,  $I_{CC3}$



(Note) HEAT FIN of TA7291F is connected to GND.

**TEST CIRCUIT 2**

$V_{IN1}$ ,  $V_{IN2}$ ,  $I_{IN}$ ,  $\Delta V_T$ ,  $I_{ref}$

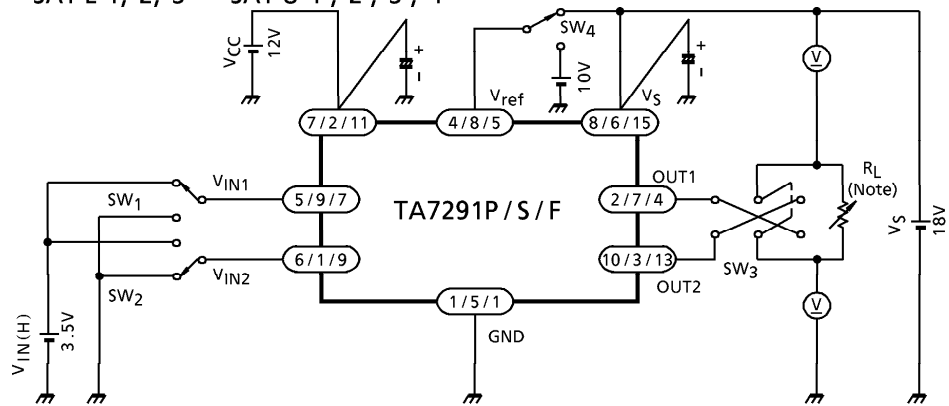


TA7291P / TA7291S / TA7291F

(Note) HEAT FIN of TA7291F is connected to GND.

**TEST CIRCUIT 3**

$V_{SATU-1, 2, 3}$   $V_{SATL-1, 2, 3}$   $V_{SATU-1', 2', 3', 4'}$

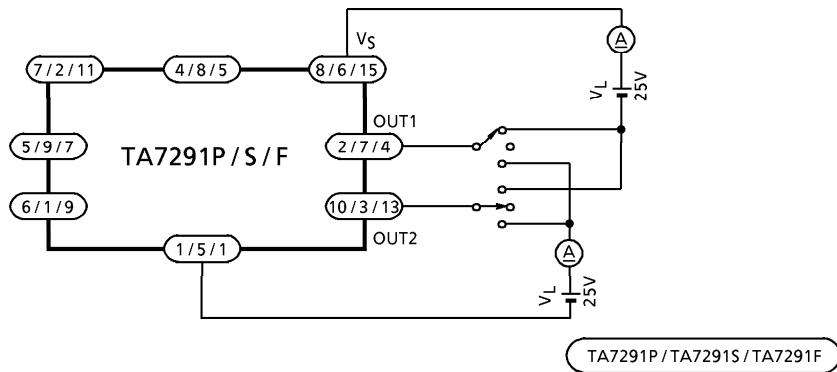


(Note)  $I_{OUT}$  calibration is required to adjust specified values of test conditions by  $R_L$ .  
 ( $I_{OUT} = 0.2\text{ A} / 0.4\text{ A} / 0.5\text{ A} / 1.0\text{ A}$ )

(Note) HEAT FIN of TA7291F is connected to GND.

**TEST CIRCUIT 4**

$I_{LU, L}$

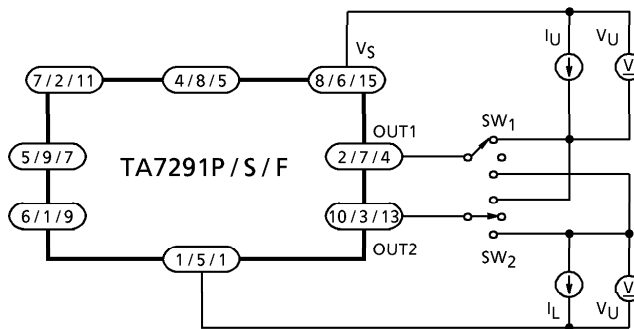


TA7291P/TA7291S/TA7291F

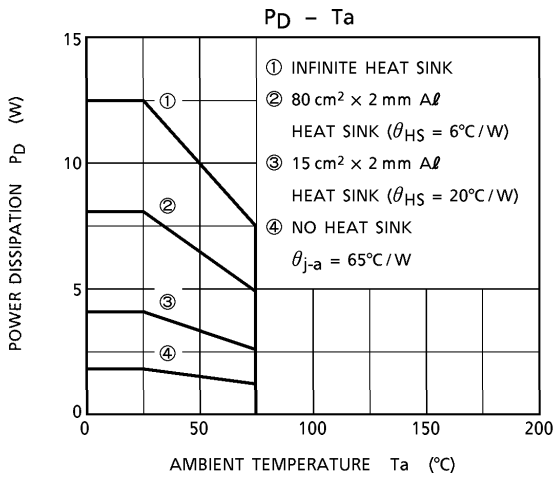
(Note) HEAT FIN of TA7291F is connected to GND.

**TEST CIRCUIT 5**

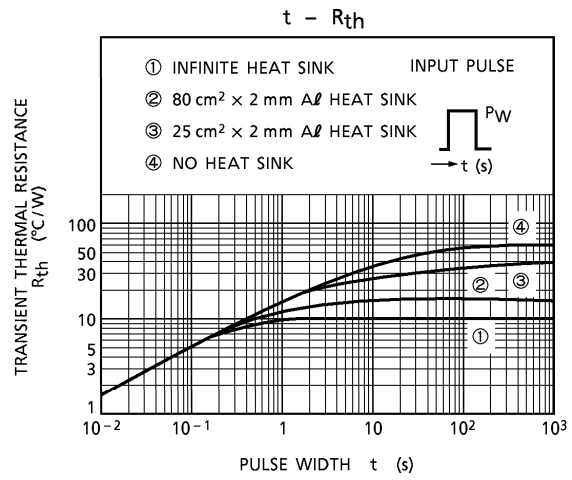
$V_{FU-1, 2}$   $V_{FL-1, 2}$



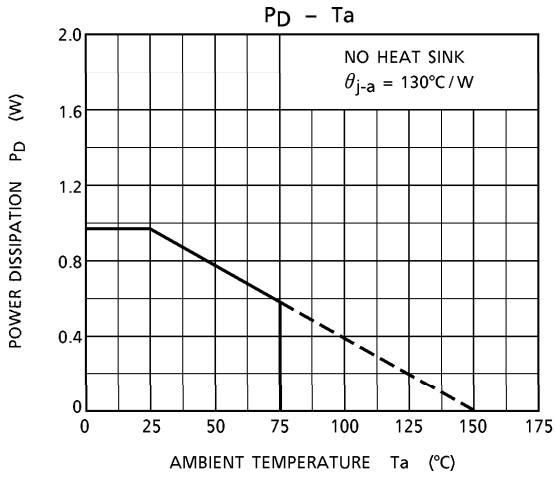
TA7291P



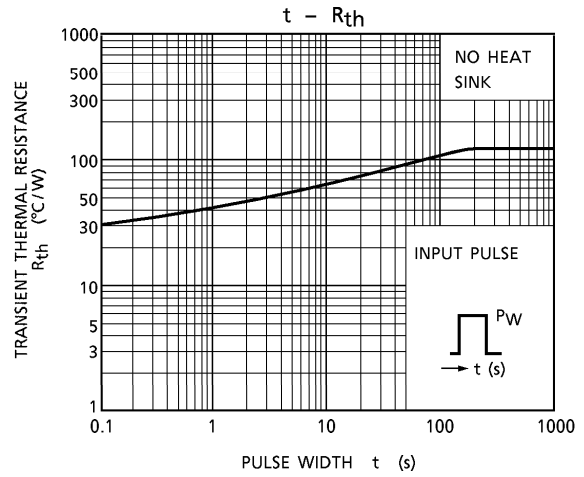
TA7291P



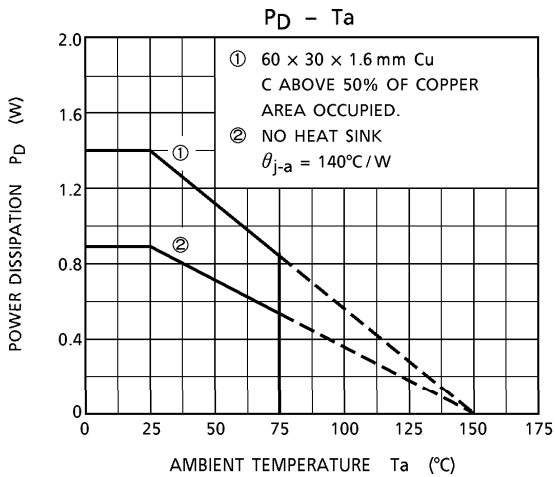
TA7291S



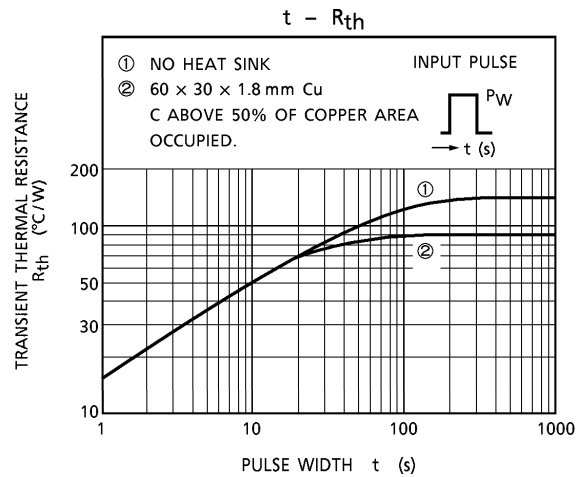
TA7291S

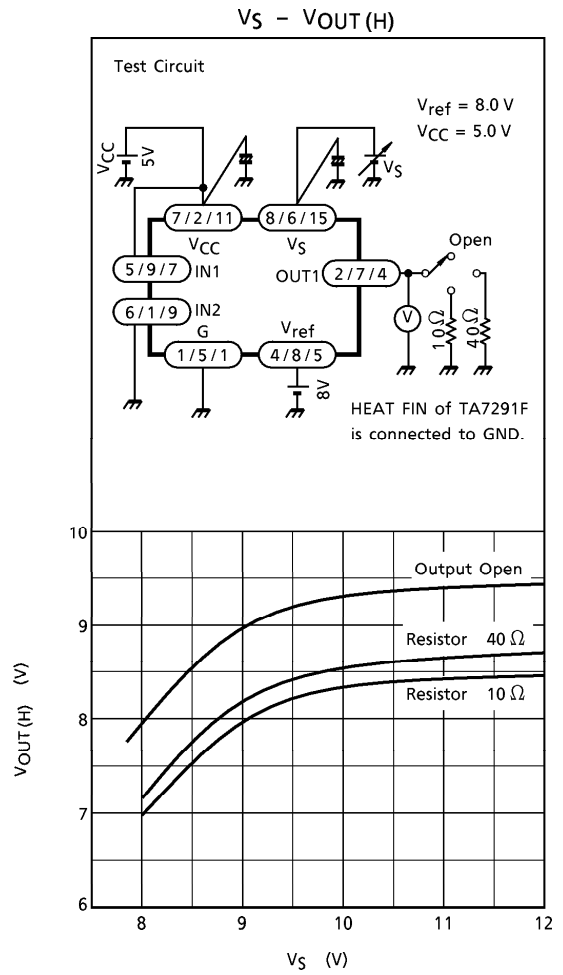
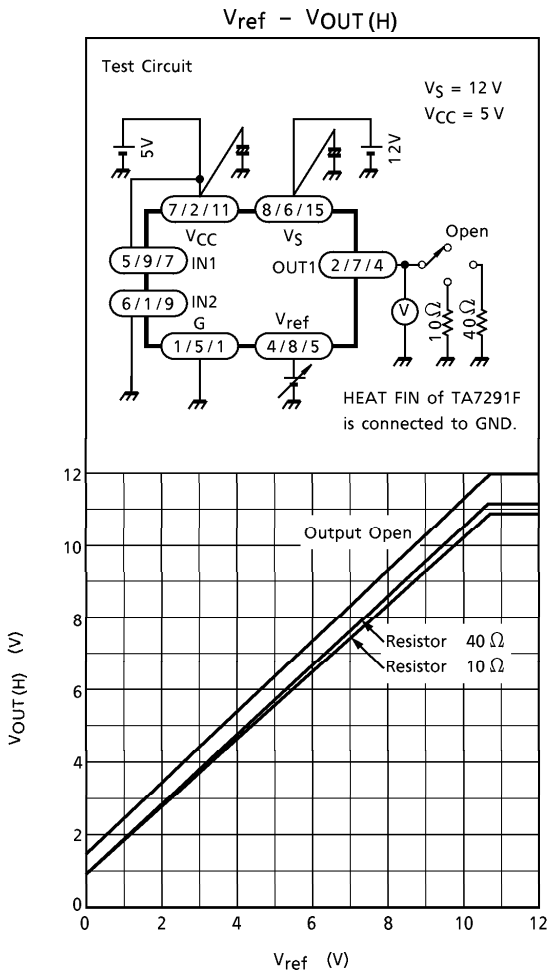
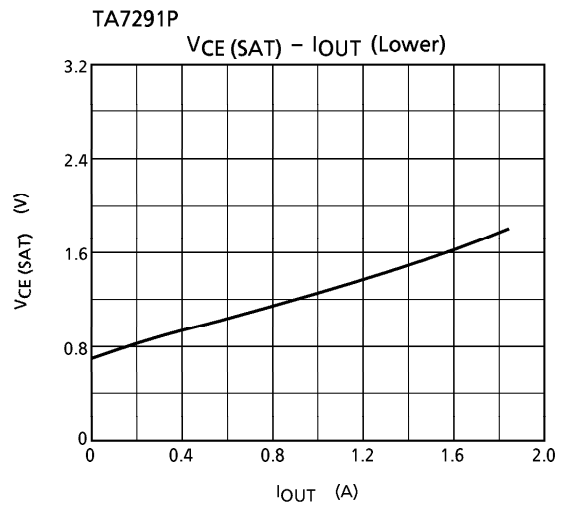
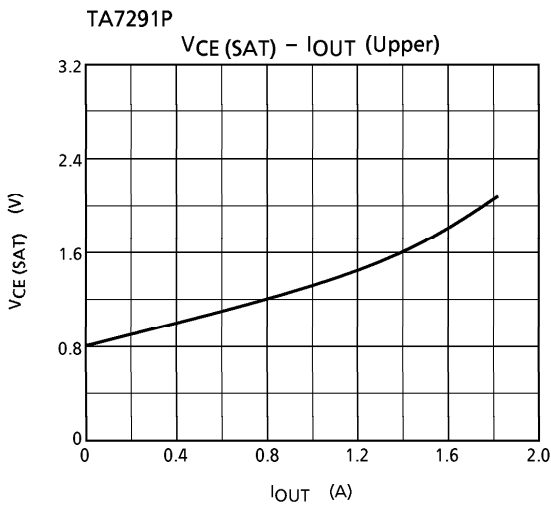


TA7291F



TA7291F



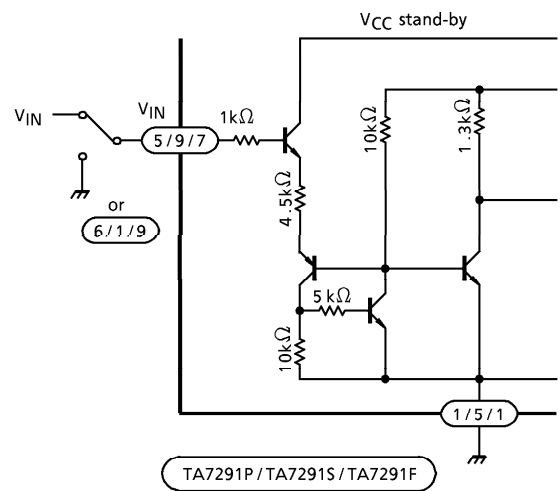




**NOTES**

**Input circuit**

Input Terminals of pin ⑤ and ⑥ (TA7291P) are all high active type and have a hysteresis of 0.7 V (typ.), 3 μA (typ.) of source mode input current is required.



**Output circuit**

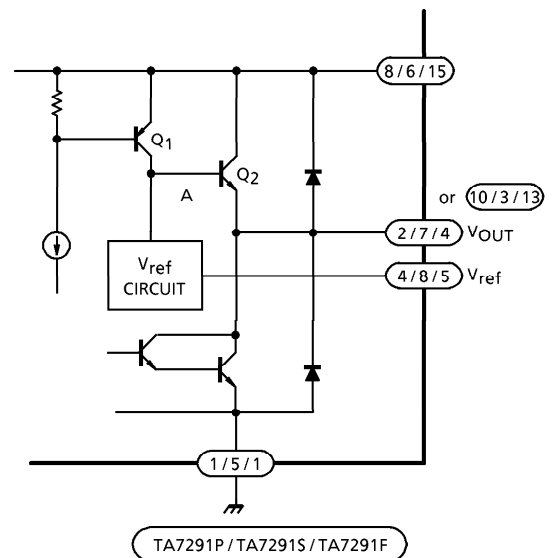
Output voltage is controlled by  $V_{ref}$  voltage.

Relationship between  $V_{OUT}$  and  $V_{ref}$  is

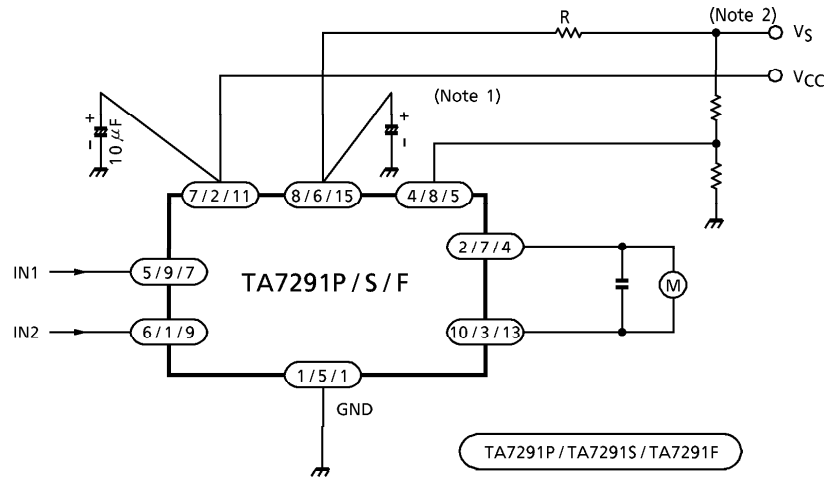
$$V_{OUT} = V_{BE} (\cong 0.7) + V_{ref}$$

$V_{ref}$  terminal required to connect to  $V_S$  terminal for stable operation in case of no requirement of  $V_{OUT}$  control.

$$V_{ref} \leq V_S$$



**APPLICATION CIRCUIT**



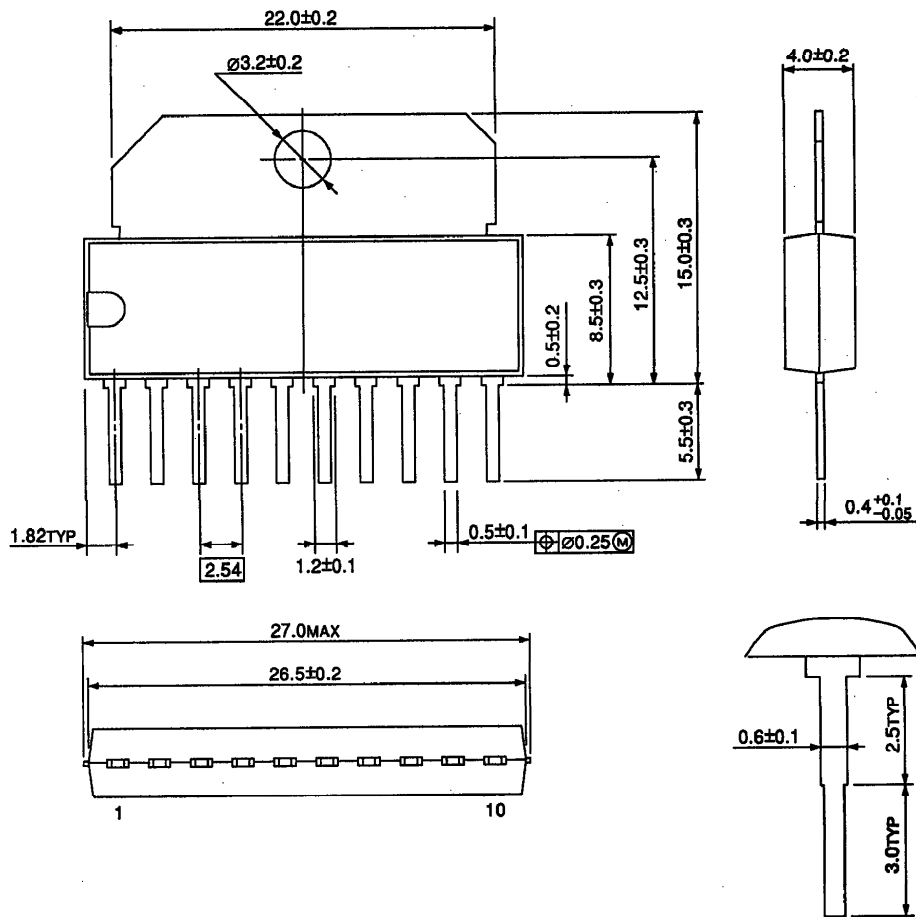
- (Note 1) Experiment to find the optimum capacitor value.
- (Note 2) To protect against excess current, current limitation resistor R should be inserted where necessary.

**NOTES**

- Be careful when switching the input because rush current may occur.  
When switching, stop mode should be entered or current limitation resistor R should be inserted.
- The IC functions cannot be guaranteed when turning power on of off.  
Before using the IC for application, check that there are no problems.
- Utmost care is necessary in the design of the output line,  $V_S$ ,  $V_{CC}$  and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

OUTLINE DRAWING  
HSIP10-P-2.54

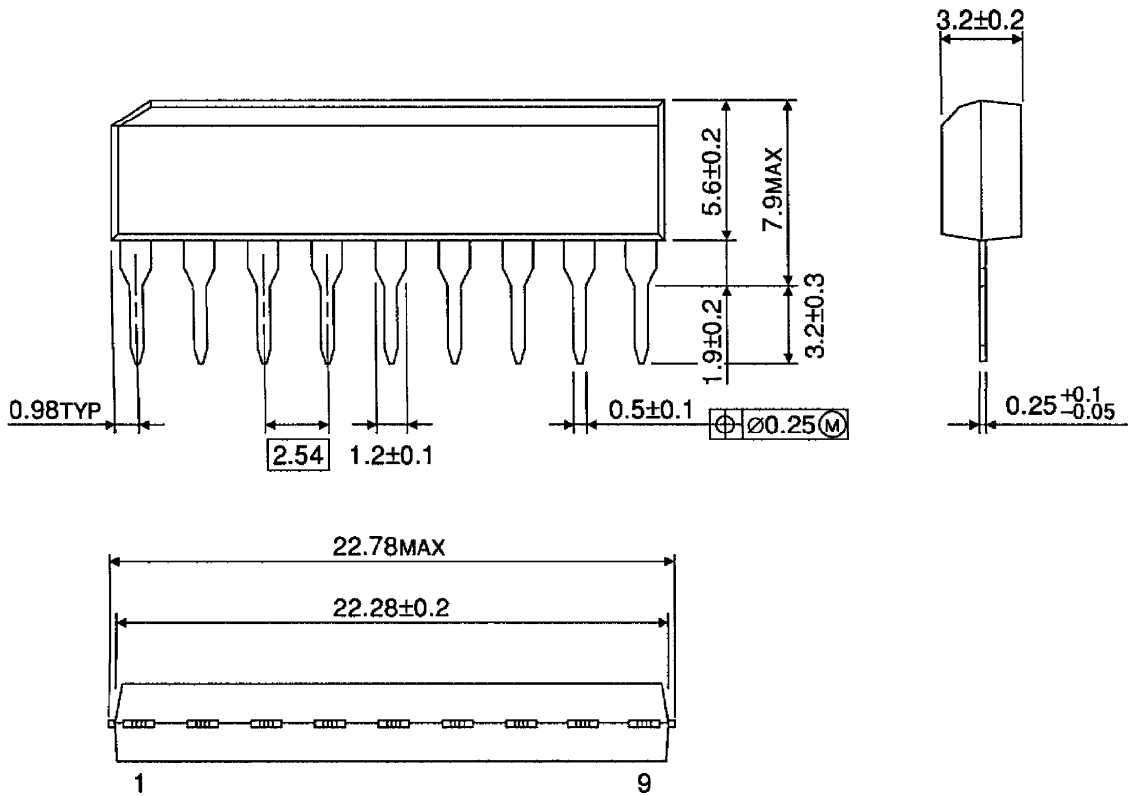
Unit : mm



Weight : 2.47 g (Typ.)

OUTLINE DRAWING  
SIP9-P-2.54A

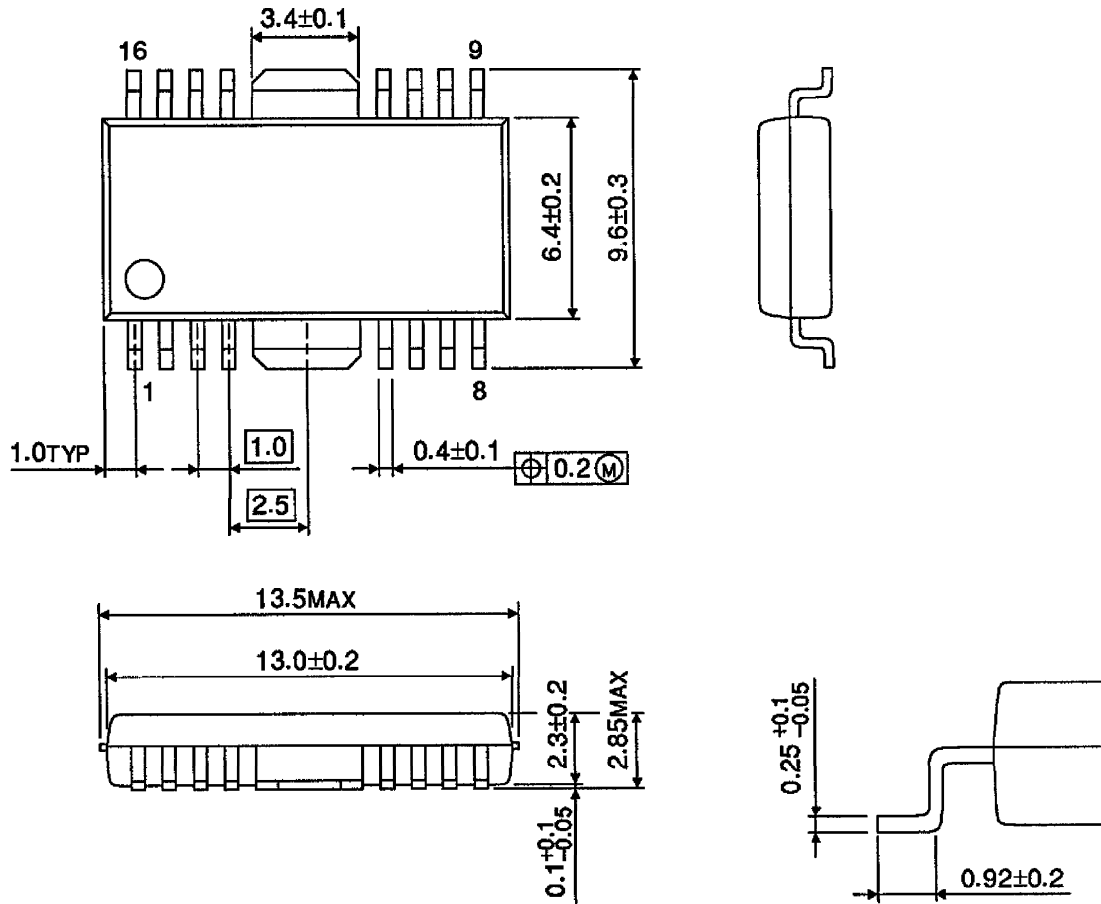
Unit : mm



Weight : 0.92 g (Typ.)

OUTLINE DRAWING  
HSOP16-P-300-1.00

Unit : mm



Weight : 0.50 g (Typ.)